PRODUCT MANUAL

TAPE DRIVE
DLT-V4

TANDBERG DATA

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Preface

This document serves as an easy-to-use information source to familiarize customers and systems professionals with the DLT-V4 tape drive system. The DLT-V4 tape drive is an extension of the Digital Linear Tape (DLT®) product family.

This chapter describes the purpose, scope, and audience of this document. It also lists the typographical conventions used in this document.

Purpose

This document describes the DLT-V4 tape drive, listing its physical, functional, and performance specifications, and describing the standards that the tape drive meets.

Audience

The primary audience for this document consists of engineers and technicians interested in integrating the DLT-V4 tape drive into tape libraries and other equipment.

Document Organization

This document is organized as follows:

- Chapter 1, Introduction, introduces the tape drive (tabletop or internal), and provides a general overview of the product.
- Chapter 2, Installing the Tape Drive, explains how to configure and install the tape drive.
- Chapter 3, Specifications, contains the tape drive specifications.
- Chapter 4, Using Your Tape Drive, contains functional information useful during the operation of the tape drive.

- Chapter 5, Using Data and Cleaning Cartridges, contains information regarding the care of tape cartridges.

Notational Conventions

This document uses the following conventions:

Note:	Notes emphasize important information related to the main topic.

Caution:	Cautions indicate potential hazards to equipment and are included to prevent damage to equipment.

Warning:	Warnings indicate potential hazards to personal safety and are included to prevent injury.

This document uses the following:

- Tape Drive System — Refers to the complete system including the cartridge.
- Tape Drive — Refers to just the tape drive and does not include the cartridge.
- Right side of the drive — Refers to the right side as you face the component being described.
- Left side of the drive — Refers to the left side as you face the component being described.
- *b* — All binary numbers are succeeded by “b.”
- *h* — All hexadecimal numbers are succeeded by “h.”
- Error or attention conditions are represented in parenthesis that translate as follows:

  (SK=S ASC=AA ASCQ=QQ)

  where:

  S — hexadecimal sense key value

  AA — hexadecimal additional sense code

  QQ — hexadecimal additional sense code qualifier

Typographical Conventions

This document uses the following typographical conventions:

Element	Convention	Example
Commands	Uppercase (unless case-sensitive)	FORMAT UNIT
Messages	Uppercase	INVALID PRODUCT NUMBER
Hexadecimal Notation	Number followed by lowercase h	25h
Binary Notation	Number followed by lowercase b	101b
Decimal Notation	Number without suffix	512
Acronyms	Uppercase	POST
Abbreviations	Lowercase, except where standard usage requires uppercase	Mb (megabits) MB (megabytes)
Dimensions in Figures	No units specified (Inches understood unless otherwise specified)	0.57 EJECT DISTANCE

Related Documents

The following documents are related to the DLT-V4 tape drive:

Document No.	Document Title	Document Description
81-81252-xx	Bezel Replacement Guide	Provides bezel replacement instructions
81-81349-xx	DLT-V4 Product Specification	This document provides detailed product specifications for the tape drive.
81-81355-xx	DLT-V4 Quick Start Guide	This document provides basic tape drive installation instructions.

Current SCSI standards documents available from www.t10.org

- SCSI Architecture Model (SAM-3)
- SCSI Primary Commands (SPC-3)
- SCSI Parallel Interface (SPI-5)
- SCSI Stream Commands (SSC-3)

Current SATA standards documents available from www.serialata.org

- Serial ATA 1.0a Specification

SCSI Standards

Copies of the approved version of the SCSI standards may be obtained from:

Global Engineering Documents
15 Inverness Way, East
Englewood, CO 80112
(800) 854-7179 or (303) 397-2740

Chapter 1
Introduction

This chapter introduces the DLT-V4 tape drive (tabletop or internal), and provides a general overview of the product.

DLT-V4 Tape Drive Overview

The DLT-V4 tape drive is a value-priced, high-reliability, high-capacity linear streaming data cartridge tape drive designed for use on entry- to mid-range computing platforms. With a combination of data compression and compaction, the DLT-V4 tape drive offers a formatted data cartridge capacity of 320 gigabytes (GB) (assuming a 2:1 compression ratio), and a sustained user data transfer rate of 20 megabytes (MB) / sec (assuming a 2:1 compression ratio).

The DLT-V4 tape drive is a 5¼-inch, half-height form-factor device that uses ½-inch tape. Its design includes a four-channel read / write head, Lempel-Ziv (DLZ) high-efficiency data compression, and a tape-mark directory to achieve fast data throughput and data access times.

Features and Upgrades

This section covers the DLT-V4 tape drive features, and information about obtaining drivers and firmware upgrades.

Features

The DLT-V4 tape drive offers the following features:

- Supported formats: DLT-V4 (read / write using DLTtape® VS1 Media data cartridges), DLT VS160 (read only using DLTtape VS1 Media data cartridges), DLT1 / VS80 (read only using DLTtape IV data cartridges).
- Uses DLTtape VS1 data cartridge.
- 5¼-inch half-height form-factor.
- Formatted data cartridge capacity of 160 GB native, 320 GB compressed.*
- Sustained user data transfer rate of 10 MB / s native, up to 20 MB / s with compression*.
- For the SCSI interface tape drive, to achieve 160 MB / s, an Ultra160, or Ultra320, Low-Voltage Differential (LVD) or Single-Ended (SE) Wide SCSI bus is required.
- For the SATA interface tape drive, a SATA interface card is required.

* In accordance with industry practice, a typical compression ratio of 2:1 is quoted. The redundancy and type of data files being written determine the actual compression ratios achieved.

Firmware Upgrades and Drivers

The manufacturer frequently provides new and updated tools to use with its tape drives. These tools include such items as upgrades for product software and firmware, and diagnostic software that may be newly developed. All these tools are available on the manufacturer's Web site.

Note:	These tools are only available to registered customers.

1. See the following procedure to access these tools.
2. Go to www.tandberg.com.

3. Click **SERVICE AND SUPPORT** in the upper menu bar. This opens the Service and Support window.
4. Explore the various pages that comprise Service and Support until you find what you need.

New tools and utilities get added frequently, so check back often.

Chapter 2

Installing the Tape Drive

This chapter explains how to configure and install the tape drive. Configuration and installation are not difficult and require only that you follow the instructions presented in this chapter.

Preparing to Install the Tape Drive

This section helps you prepare to install the DLT-V4 tape drive (tabletop or internal).

Before You Start

Installing the DLT-V4 SCSI tabletop tape drive requires no special tools. For the SCSI interface, you will need a ballpoint pen to change the SCSI ID switch on the rear panel of the tape drive.

If you are installing a DLT-V4 SATA internal tape drive, see Installing the Internal SATA Tape Drive on page 25 for instructions. Installing the DLT-V4 internal tape drive requires only the usual tools needed to install an internal tape drive in the computer you have chosen to house the tape drive (for example, a screwdriver and some ESD protection).

SCSI Bus Requirements

The DLT-V4 SCSI interface tape drive (tabletop and internal) incorporates a wide Ultra160 low-voltage differential (LVD) small computer system

interface (SCSI) bus, but you can also attach it to a single-ended (SE) SCSI bus.

Make sure the SCSI host adapter or controller supports these configurations. If you connect the tape drive to an SE bus, or if there are SE devices attached to the same SCSI bus, the tape drive's performance is limited to the maximum data transfer speed and maximum cable lengths of the SE bus (usually 40 MB/s). *The DLT-V4 is not compatible with a high-voltage differential (HVD) SCSI bus.*

Physical Considerations

If you attach the tape drive to a narrow (50-pin) SCSI bus, you must use a customer-supplied 68-pin to 50-pin adapter that terminates the unused 18 pins. These adapters are sometimes labeled **high-byte termination**.

Make sure the total length of the SCSI bus does not exceed the ANSI SCSI standard of 19 feet (6 meters) for an SE SCSI bus, 40 feet (12 meters) for an LVD SCSI bus with multiple devices, or 82 feet (25 meters) for an LVD SCSI bus with a single device.

SATA Requirements

The DLT-V4 SATA interface tape drive (internal only) incorporates a Serial ATA (SATA) bus.

Make sure the total length of the internal SATA data cable does not exceed the SATA standard of approximately 40 inches (1 meter).

Installing the Tabletop SCSI Tape Drive

This section contains step-by-step instructions for installing the tabletop SCSI tape drive.

Identifying the Steps

Installing the tabletop SCSI tape drive is fast and easy when you follow the instructions in this section in the order presented. Complete the following steps, covered in the next few sections:

Table 1 Installing the Tabletop SCSI Tape Drive

Step	Instruction	Refer to
1	Unpack and check the tape drive for shipping damage.	page 7
2	Select a location near the server or workstation that is to host the tape drive.	page 7
3	Set the SCSI ID for the tape drive, if you do not want to use the factory-set default.	page 8
4	Shut down and power off the server or workstation that is to host the tape drive.	
5	Install an LVD/SE SCSI host adapter in the server or workstation, if necessary.	
6	Connect the SCSI cable to the tape drive and SCSI host adapter.	page 9
7	Connect the terminator on the tape drive—if it is the last or only device on the SCSI bus.	page 11
8	Connect the power cable to the tape drive, server or workstation, and all peripheral devices. Plug the power cable into the nearest power outlet and apply power to all devices.	
9	Check the tape drive to make sure it is working properly.	

Unpacking the Tabletop Tape Drive and Selecting a Location

Before you begin, clear a desk or table so that you can unpack the tape drive. You also need to select a location near the server or workstation that has room for the tape drive to sit without being crowded.

> **Note:** If the room in which you are working differs from the temperature at which the tape drive was shipped or stored by 30 ºF (17 ºC) or more, let the tape drive acclimate to the surrounding environment for at least 12 hours before opening the shipping carton.

Unpacking the Tabletop Tape Drive

Before you do anything else, unpack and inspect the tabletop SCSI tape drive for shipping damage. If you notice any damage, report it both to the sales representative and to the shipping company immediately.

> **Note:** Save the packing materials in case you need to move or ship the tape drive in the future. You must ship the tabletop tape drive in the original (or equivalent) packing materials or you will invalidate the warranty.

Selecting a Location for the Tabletop Tape Drive

Select a location for the tape drive that is flat, sturdy, level, and close to the server or workstation. A desk or tabletop surface is most suitable. Regardless of the location you choose for the tape drive, make sure the environment is free from dust, cigarette smoke, and excessive temperature and humidity. See the *DLT-V4 Product Specification* for acceptable operating temperature and humidity limits.

Be sure to follow these additional guidelines when selecting a location for the tape drive:

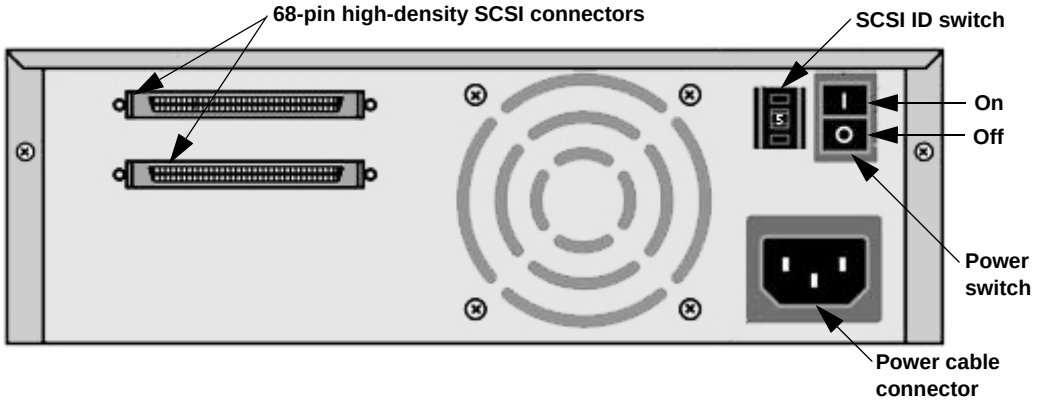
- Allow at least 6 inches (15.2 cm) behind the tape drive for proper cooling.
- Avoid locations near printers or photocopy machines, both of which produce paper fiber and other types of dust and airborne contaminants.
- Do not place the tape drive on the floor.

- Avoid locations near generators, electric motors, audio speakers, or other sources of magnetic fields. Magnetic fields can adversely affect the tape drive and data cartridges.

Setting the SCSI ID

All SCSI devices attached to the server or workstation must have a unique SCSI ID. Check the SCSI IDs on all other devices on the selected server or workstation, including the SCSI host adapter, and select an unused SCSI ID for the tape drive. The factory default SCSI ID for this tape drive is 5, as shown in figure 1. If the tape drive's factory default SCSI ID is not already in use by another device on the same SCSI bus, you do not need to change the SCSI ID.

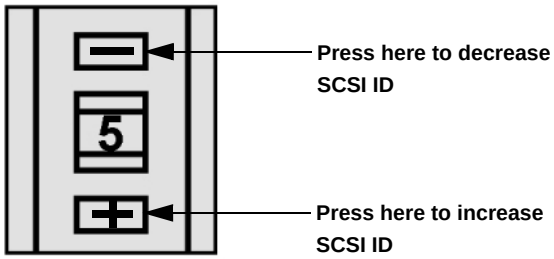
Figure 1 Rear Panel SCSI Tabletop Tape Drive



Note: If you attach the tape drive to a narrow (50-pin) SCSI bus, you can only use IDs 0 through 7.

To set the SCSI ID on the tape drive, use a small screwdriver or ballpoint pen to press the button above the SCSI ID switch to select the next lower SCSI ID. Press the button below the SCSI ID switch to select the next higher SCSI ID. Each time you press one of these buttons, the SCSI ID decreases or increases by one. Press the appropriate button until the desired SCSI ID appears on the switch display.

Figure 2 SCSI ID Selector Switch



Connecting the SCSI Interface Cables

In the final installation stage, you connect the SCSI and power cables to the tape drive.

> **Note:** If the selected server or workstation does not already have an installed SCSI host adapter, you will need to install one. For more information on SCSI host adapter requirements, see SCSI Bus Requirements on page 4.

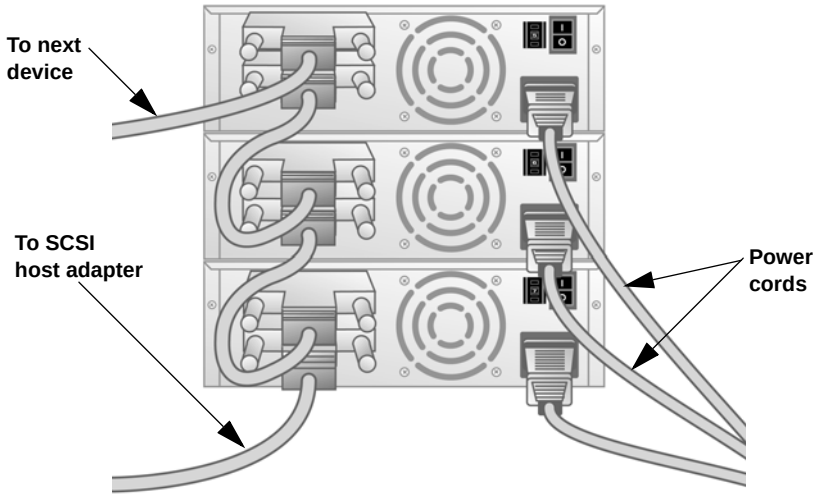
To connect the SCSI and power cables to the tape drive, follow these steps:

1. Shut down the operating system and power down the server or workstation.
2. Power off all peripheral devices, such as printers and other SCSI devices.

> **Caution:** **Do not go to step 3** until you have completed steps 1 and 2. Failure to follow these instructions may result in damage to the tape drive or other devices.

3. Obtain a SCSI cable with an open 68-pin, high-density connector.
4. Connect one end of the SCSI cable to one of the connectors on the rear panel of the tape drive as shown in figure 3. Either SCSI connector works equally well. Figure 3 does not show a terminator because none of the three tape drives in the illustration are at the end of the SCSI bus.

Figure 3 Tabletop Tape Drive SCSI and Power Cable Connections



5 Connect the other end of the SCSI cable to the connector on the SCSI host adapter or to the connector on the previous SCSI device on the SCSI bus, as shown in figure 4.

Figure 4 Server SCSI Cable Connections

Terminating the SCSI Tabletop Tape Drive

You must terminate the tape drive if it is the last physical device on the SCSI bus (at the end of the SCSI chain). If another SCSI device is the last device on the SCSI bus, confirm that it is properly terminated and do *not* terminate the tape drive.

Note:	Regardless of which device terminates the SCSI bus, it must have power applied and be powered on for proper termination to occur.

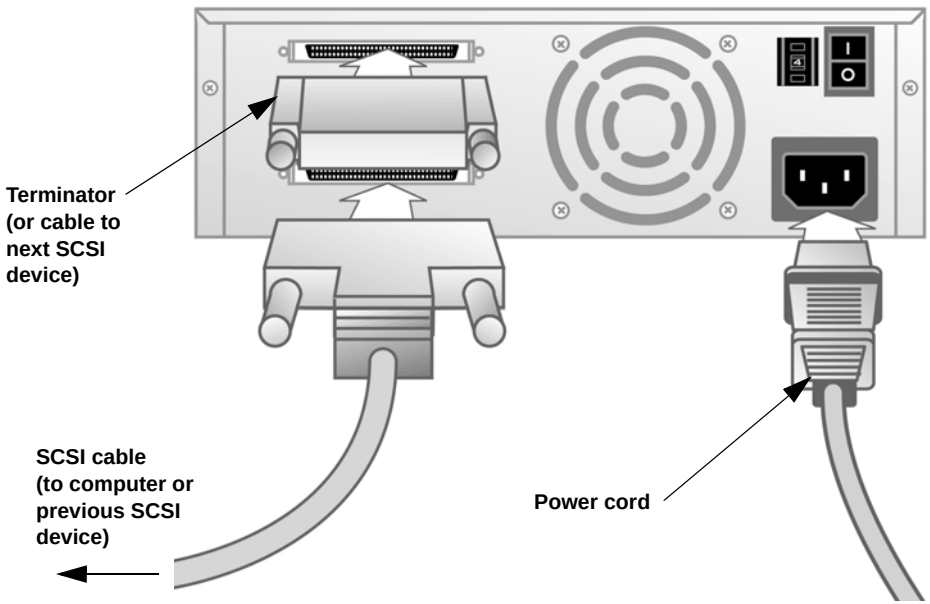
To terminate the tape drive, locate the terminator in the accessories package and press it firmly into either of the two SCSI connectors on the rear panel of the tape drive. Secure the terminator by tightening the screws until snug. See figure 5 for more details.

Powering the Terminator

At least one device on the SCSI bus must supply terminator power (**TERMPWR**). The factory default for the tape drive is for **TERMPWR** to be enabled. Only an authorized service provider can disable the tape drive **TERMPWR** setting. Attach the terminator as shown in figure 5.

Note:	It is acceptable for more than one device on the SCSI bus to provide **TERMPWR**.

Figure 5 Tabletop SCSI Tape Drive Rear Panel Connections



Completing the Tabletop SCSI Tape Drive Installation

1 Secure the SCSI cable connectors by tightening the screws until snug.

> **Note:** If the SCSI cable does not fit the connector on the SCSI host adapter, you either have an incompatible SCSI host adapter or you need to purchase a cable adapter. Contact the sales representative or the SCSI host adapter manufacturer for information.

2 Make sure the power switch on the rear panel of the tape drive is in the OFF position (tabletop model only). Attach the female connector on the power cable to the power connector on the rear panel of the tape drive, as shown in figure 5.

3 Connect the power cables to the server or workstation and all peripheral devices.

4 Plug the power cable into a nearby power outlet.

5 Power on the tape drive and any other devices you powered off earlier.

6 Power on the server or workstation and allow its operating system to start.

7 Check the tape drive to make sure it is working properly. See Power-On Self-Test (POST) Indicator Activity on page 47 to learn about the tape drive's self-test and initialization features.

Installing the Internal SCSI Tape Drive

This section contains step-by-step instructions for installing the internal SCSI tape drive.

Identifying the Steps

Installing the tape drive is fast and easy when you follow the instructions in this section in the order presented. Complete the following steps, covered in the next few sections:

Table 2 Installing the DLT-V4 Internal SCSI Tape Drive — Overview

Step	Instruction	Refer to
1	Unpack and check the tape drive for shipping damage.	page 15
2	Select a server or workstation that is to host the tape drive.	
3	Set the SCSI ID for the tape drive, if you do not want to use the factory-set default.	page 16
4	Shut down and power off the server or workstation that is to host the tape drive. Power off all peripheral devices attached to the server or workstation.	
5	Install an active LVD/SE terminator on the SCSI cable if the tape drive is the last or only device on the SCSI bus.	page 17
6	Remove the cover from the server or workstation, as explained in the server or workstation's documentation	page 19
7	Install an LVD/SE SCSI host adapter in the server or workstation, if necessary.	
8	Install the tape drive in an open drive bay.	page 19

Step	Instruction	Refer to
9	Connect the SCSI cable to the tape drive and SCSI host adapter. Connect the terminator on the tape drive—if it is the last or only device on the SCSI bus.	page 22
10	Connect a power cable to the tape drive.	
11	Secure the tape drive in the selected server or workstation.	
12	Install the server or workstation's cover, connect power cables to all peripheral devices, and apply power to the server or workstation and all peripheral devices.	
13	Check the tape drive to make sure it is working properly.	

Unpacking the Internal SCSI Tape Drive

Before you do anything else, unpack and inspect the tape drive for shipping damage. If you notice any damage, report it both to the sales representative and to the shipping company immediately.

> **Note:** Save the packing materials in case you need to move or ship the tape drive in the future. You must ship the tape drive in the original (or equivalent) packing materials or you will invalidate the warranty.

If there is no damage to the tape drive, select a server or workstation to host the tape drive, then move on to the following installation steps.

Configuring the Internal SCSI Tape Drive

Configuring the tape drive is fast and easy. You only need to select a unique SCSI ID and decide if the tape drive needs to be terminated. The following sections explain how to configure the tape drive.

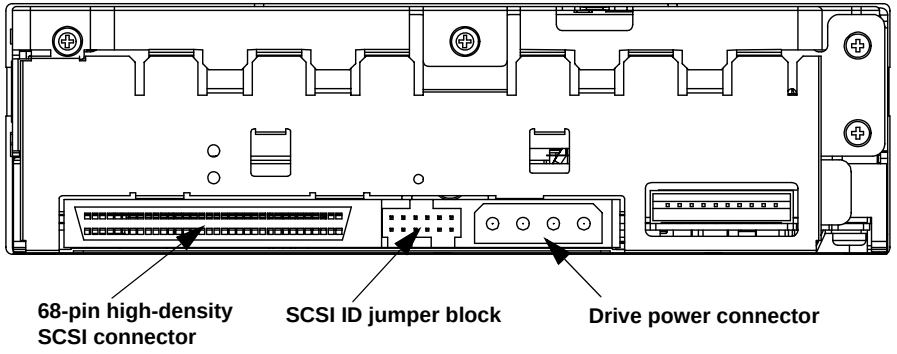
Setting the SCSI ID

All SCSI devices attached to the server or workstation that is to host the tape drive must have a unique SCSI ID. Check the SCSI IDs on all other devices on the selected server or workstation, including the SCSI host adapter, and select an unused SCSI ID for the tape drive. The factory default SCSI ID is 5. If the tape drive's factory default SCSI ID is not being used, you do not need to change the SCSI ID.

> **Note:** If you plan to attach the tape drive to a narrow (50-pin) SCSI bus, you can only use IDs 0 through 7.

Locate the SCSI ID jumpers on the rear panel of the tape drive, as shown in figure 6.

Figure 6 Rear Panel Connections for the Internal SCSI Tape Drive



Use the supplied jumpers to select the desired SCSI ID as shown in table 3:

Table 3 Selecting the SCSI ID

SCSI ID	0	1	2	3
Jumper Block				
SCSI ID	4	5[a]	6	7

Jumper Block				
SCSI ID	**8**	**9**	**10**	**11**
Jumper Block				
SCSI ID	**12**	**13**	**14**	**15**
Jumper Block				

a. Factory default SCSI ID

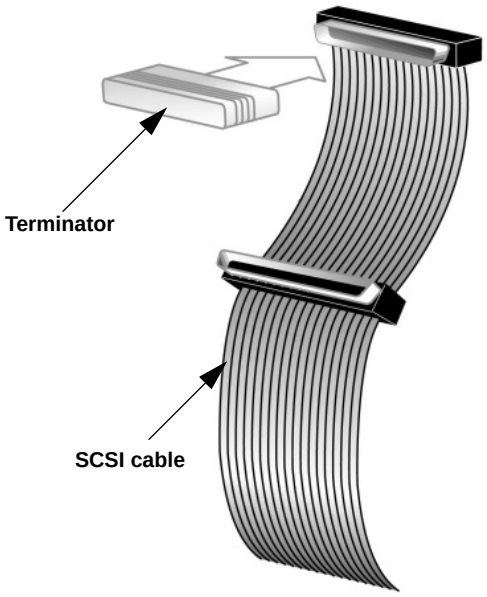
Terminating the Internal SCSI Tape Drive

If the tape drive is the only SCSI device attached to the selected server other than the SCSI host adapter, or if it is the last physical device on the SCSI bus (at the end of the SCSI chain), you must terminate it. If another SCSI device is the last device on the SCSI bus, confirm that it is properly terminated and do *not* terminate the tape drive.

> **Note:** Regardless of which device terminates the SCSI bus, that device must have power applied and be powered on for proper termination to occur.

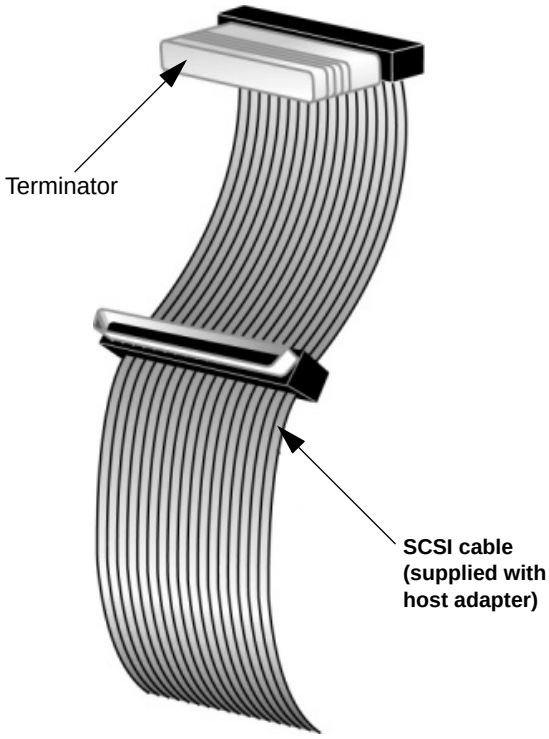
To terminate the tape drive, install an active LVD/SE cable-end or inline terminator on the SCSI cable you intend to use with the tape drive, as shown in figure 7. You can use a cable-end terminator or an inline terminator, whichever is most convenient. See the terminator's instructions for more information.

Figure 7 SCSI Interface — Terminator Installation



Note: If the SCSI cable that came with the SCSI host adapter already has a terminator built into it, do not use another terminator. Figure 8 shows an example of such a cable.

Figure 8 SCSI Cable with Built-in Terminator



Installing the Internal SCSI Tape Drive

In the final installation stage, you install the tape drive in the server or workstation and connect the SCSI and power cables.

To install the tape drive, follow these steps:

1. Shut down the operating system and power off the server or workstation.
2. Power off all peripheral devices, such as printers and other SCSI devices.

> **Caution:** **Do not go to step 3** until you have completed steps 1 and 2. Failure to follow these instructions may result in damage to the tape drive or other devices.

3. Remove the cover from the server or workstation as described in the server or workstation's documentation.

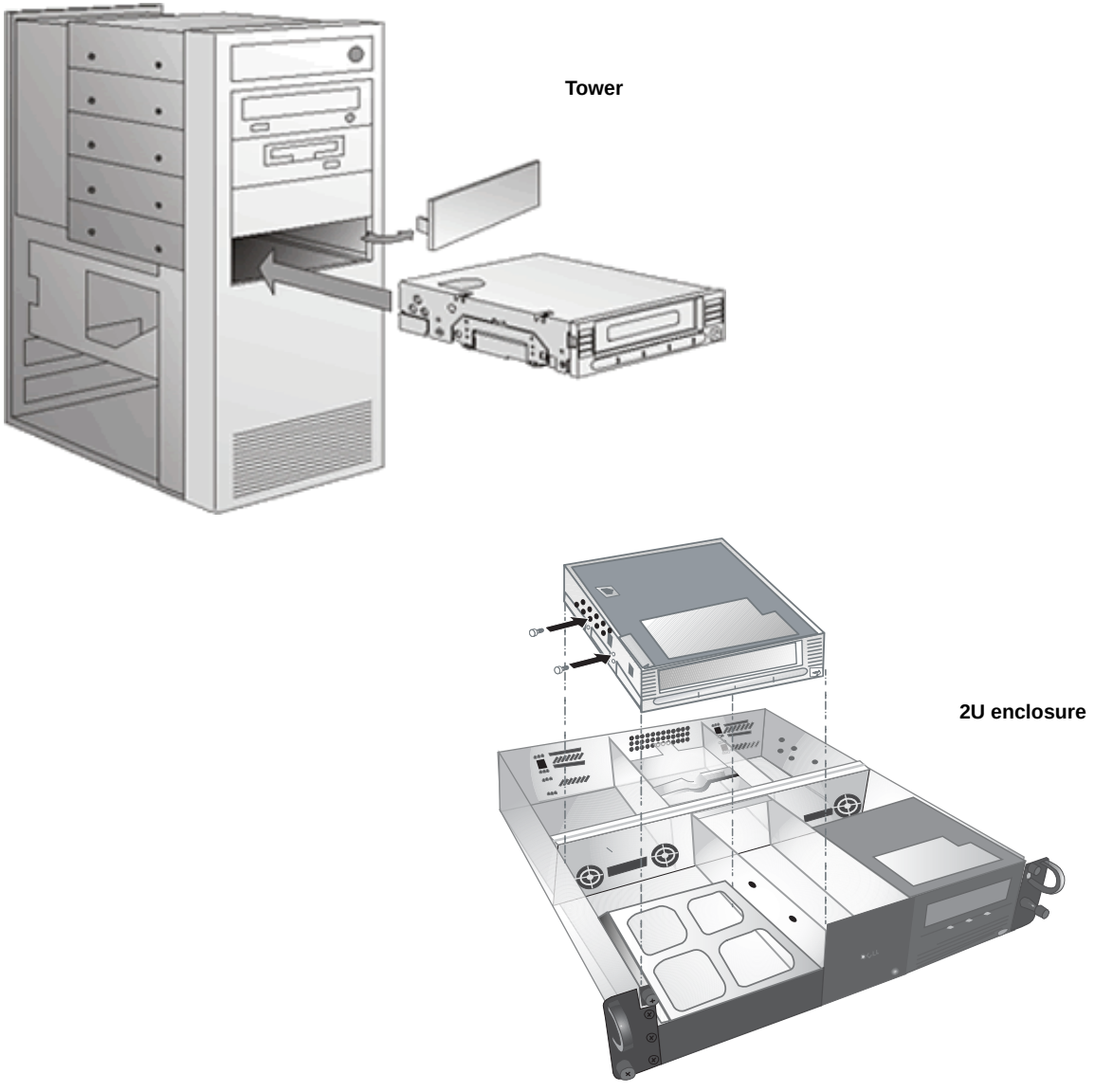
Figure 9 Removing the Workstation Cover (example)

4 Locate an available 5¼-inch drive bay and remove the front cover from the drive bay as described in the server or workstation's documentation.

> **Note:** Install a SCSI host adapter in the selected server or workstation now, if necessary. For more information on SCSI host adapter requirements, see SCSI Bus Requirements on page 4.

5 Slide the tape drive into the open drive bay.

Figure 10 Installing the Internal SCSI Tape Drive in an Open Bay



6 Obtain a SCSI cable with an open 68-pin, high-density connector.

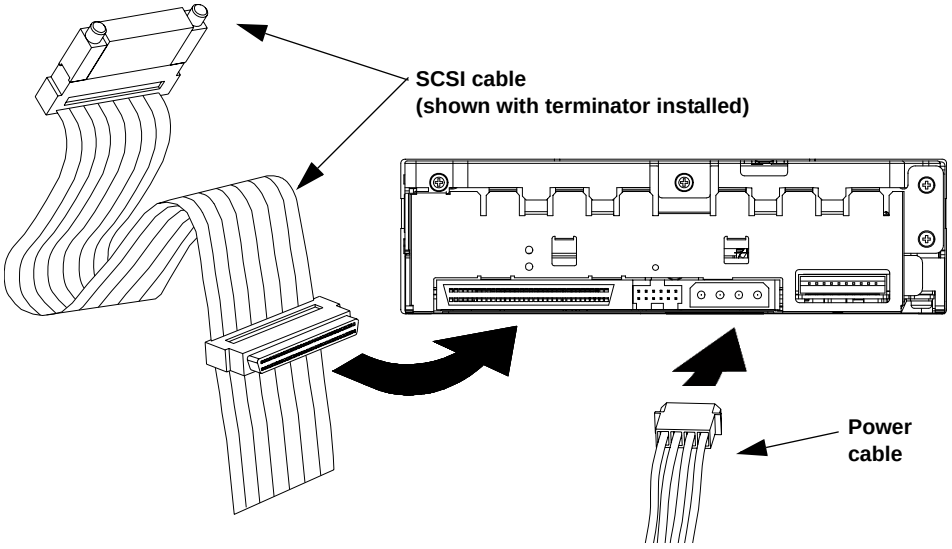
7 Connect one end of the SCSI cable to the SCSI connector on the rear panel of the tape drive. The SCSI connectors are keyed, preventing improper connection.

> **Note:** If the SCSI cable does not fit the connector on the SCSI host adapter, you either have an incompatible SCSI host adapter or you need to purchase a cable adapter. Contact your sales representative or the SCSI host adapter manufacturer for information. See Terminating the Internal SCSI Tape Drive on page 17 to determine if you need to use an LVD/SE terminator with the SCSI cable.

8 Connect the other end of the SCSI cable to the SCSI host adapter, aligning the colored stripe on the cable with pin 1 on the SCSI host adapter's connector.

9 Locate an available power cable in the server or workstation and attach it to the power connector on the rear panel of the tape drive. The connector is keyed, preventing improper connection.

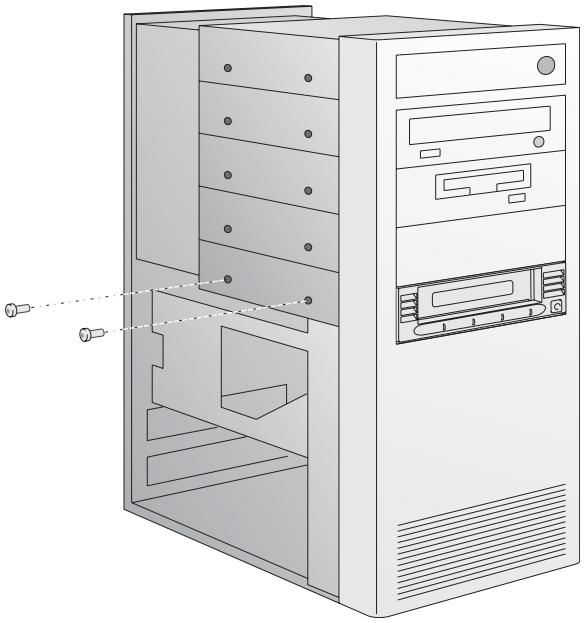
Figure 11 Internal SCSI Tape Drive SCSI and Power Cable Location



Completing the Internal SCSI Tape Drive Installation

1 Secure the internal SCSI tape drive with the necessary mounting screws, either in the sides or bottom of the tape drive sled, as appropriate for the server or workstation chassis. See figure 17 for an example of where you might find these screws.

Figure 12 Securing the Internal SCSI Tape Drive in the Installation Bay



Note: Some servers and workstations require mounting rails for internal devices. Contact the server or workstation manufacturer for information.

2 Replace the cover on the server or workstation.

3 Connect the power cord to the server or workstation and any peripheral devices that you detached earlier.

4 Power on the server or workstation and allow its operating system to start.

5 Check the tape drive to make sure it is working properly. See Power-On Self-Test (POST) Indicator Activity on page 47 to learn about the tape drive's self-test and initialization features.

Installing the Internal SATA Tape Drive

This section contains step-by-step instructions for installing the DLT-V4 internal SATA tape drive.

Identifying the Steps

Installing the tape drive is fast and easy when you follow the instructions in this section in the order presented. Complete the following steps, covered in the next few sections:

Table 4 Installing the DLT-V4 Internal SATA Tape Drive — Overview

Step	Instruction	Refer to
1	Unpack and check the tape drive for shipping damage.	page 26
2	Select a server or workstation that is to host the tape drive.	
3	Shut down and power off the server or workstation that is to host the tape drive. Power off all peripheral devices attached to the server or workstation.	page 26
4	Remove the cover from the server or workstation, as explained in the server or workstation's documentation	
5	Install a SATA host adapter in the server or workstation, if necessary.	
6	Install the tape drive in an open drive bay.	page 27
7	Connect the SATA cable to the tape drive and SATA host adapter.	page 29
8	Connect a SATA power cable to the tape drive.	
9	Secure the tape drive in the selected server or workstation.	

Step	Instruction	Refer to
12	Install the server or workstation's cover, connect power cables to all peripheral devices, and apply power to the server or workstation and all peripheral devices.	page 31
13	Check the tape drive to make sure it is working properly.	

Unpacking the Internal SATA Tape Drive

Before you do anything else, unpack and inspect the tape drive for shipping damage. If you notice any damage, report it both to the sales representative and to the shipping company immediately.

Note: Save the packing materials in case you need to move or ship the tape drive in the future. You must ship the tape drive in the original (or equivalent) packing materials or you will invalidate the warranty.

If there is no damage to the tape drive, select a server or workstation to host the tape drive, then move on to the following installation steps.

Installing the Internal SATA Tape Drive

In the final installation stage, you install the tape drive in the server or workstation and connect the data and power cables.

To install the tape drive, follow these steps:

1. Shut down the operating system and power off the server or workstation.
2. Power off all peripheral devices, such as printers and other connected devices.

Caution: **Do not go to step 3** until you have completed steps 1 and 2. Failure to follow these instructions may result in damage to the tape drive or other devices.

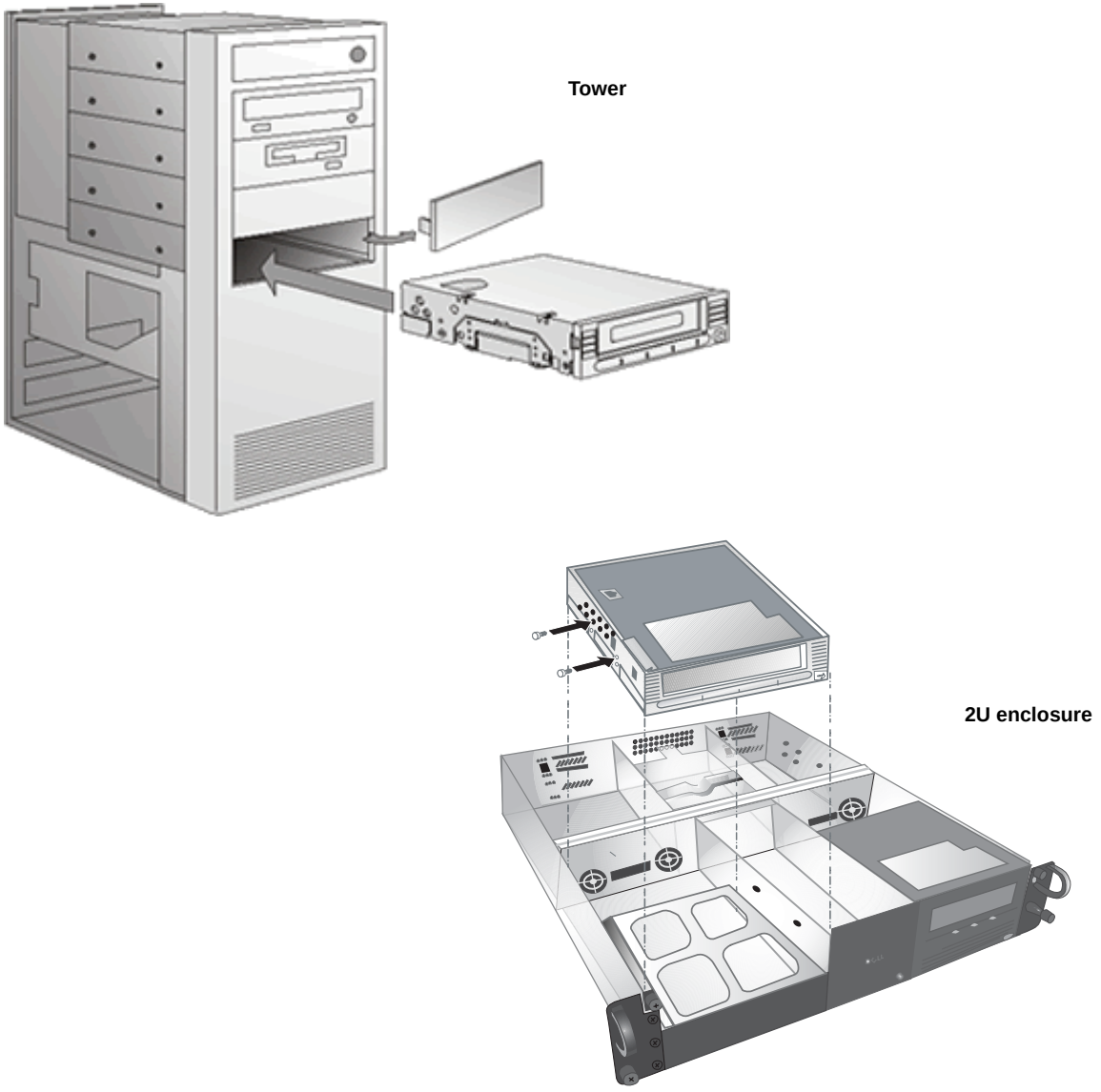
3. Remove the cover from the server or workstation as described in the server or workstation's documentation.

Figure 13 Removing the Workstation Cover (example)

4 Locate an available 5¼-inch drive bay and remove the front cover from the drive bay as described in the server or workstation's documentation.

5 Slide the tape drive into the open drive bay.

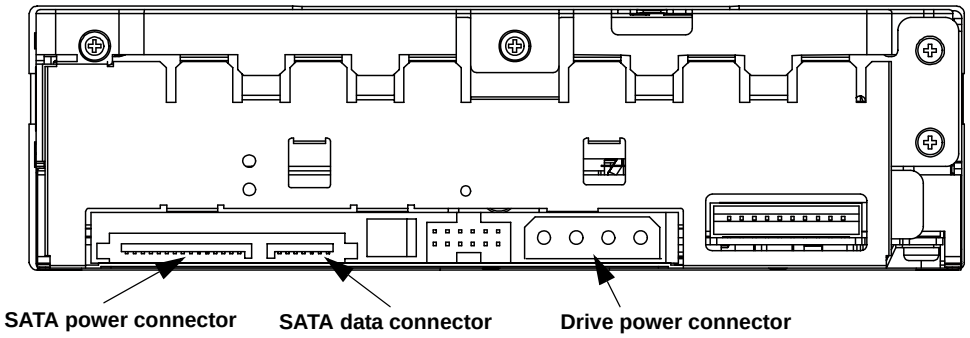
Figure 14 Installing the Internal SATA Tape Drive



Connecting the Internal SATA Tape Drive to the Server

The internal SATA tape drive attaches to the server through a SATA interface card.

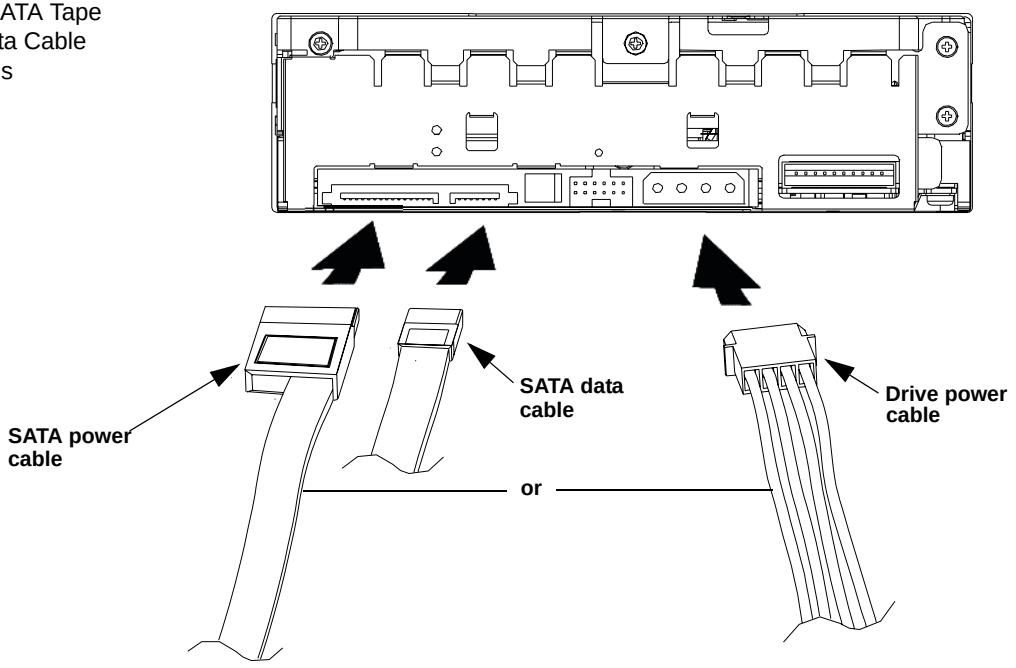
Figure 15 Rear Panel Connections for the SATA Internal Tape Drive



Caution: Connect only one power cable to the drive; connecting both the SATA power cable and the drive power cable to the tape drive may damage the tape drive.

1. Connect one end of the SATA data cable to the tape drive and the other end of the SATA data cable to the SATA host bus adapter.
2. Connect *either* the SATA power cable *or* drive power cable to the tape drive.

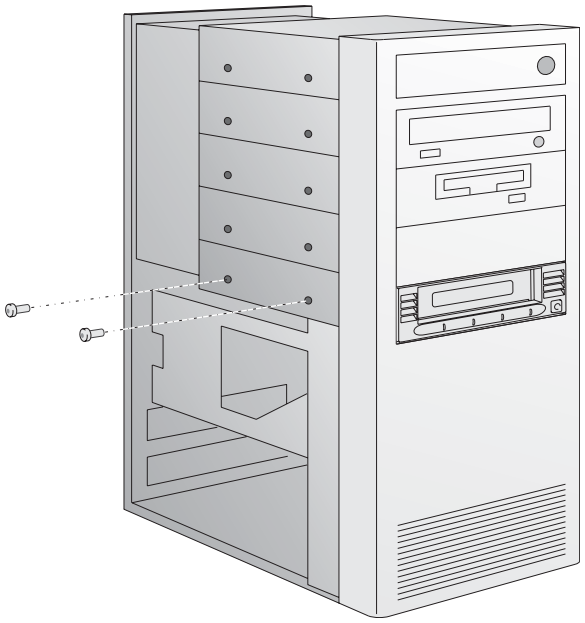
Figure 16 Internal SATA Tape Drive Power and Data Cable Connection Locations



Completing the Internal SATA Tape Drive Installation

1 Secure the internal SATA tape drive with the supplied mounting screws in the installation bay, either on the sides or bottom of the tape drive sled, as appropriate for the server or workstation chassis. See figure 17 for an example of where you might find these screws.

Figure 17 Securing the Internal SATA Tape Drive in the Installation Bay



Note: Some servers and workstations require mounting rails for internal devices. Contact the server or workstation manufacturer for information.

2. Replace the cover on the server or workstation.
3. Connect the power cord to the server or workstation and any peripheral devices that you detached earlier.
4. Power on the server or workstation and allow its operating system to start.
5. Check the tape drive to make sure it is working properly. See Power-On Self-Test (POST) Indicator Activity on page 47 to learn about the tape drive's self-test and initialization features.

Installing the Device Drivers

This section describes how to install device drivers for Microsoft Microsoft Windows 2000, Windows XP, and Windows 2003 Server.

> **Note:** If you intend to use native operating system backup applications, you can find the required device drivers at www.tandberg.com. Commercial backup applications generally provide all necessary device driver support.

Microsoft Windows XP and Windows Server 2003

1. Make sure that you are logged on to the server or workstation with Administrator privileges.
2. Download and extract the required driver files from www.tandberg.com. The system may automatically detect the DLT-V4 tape drive and display the "Found New Hardware Wizard". If the Wizard appears, proceed directly to step 3, otherwise start the Wizard manually as follows:
   a. Right-click **My Computer**, and select **Manage** from the drop-down menu. This will start the Computer Management applet.
   b. In the left window under **System Tools**, double-click **Device Manager**.
   c. In Device Manager, the DLT-V4 tape drive will be listed under either "Tape drives" or "Other devices". Locate the entry for the DLT-V4 tape drive. Then double-click that entry to display the Drive Properties.
   d. Click the **Driver** tab. Then click **Update Driver ...**.
   e. The "Hardware Update Wizard" will start. Proceed with step 3.
3. Select "Install from a list or specific location (Advanced)". Then click **Next**.
4. In the next view, ensure that the option "Search for the best driver in these locations" is selected. Then clear the "Search removable media" box and instead select "Include this location in the search".
5. Click **Browse ...**, and select the folder where you saved the driver files. Then click **OK**.

6 Click **Next** to install the driver. The next view completes the Wizard.

7 Click **Finish**. You may be prompted to reboot your system.

The DLT-V4 device driver is installed.

Microsoft Windows 2000

1 Make sure that you are logged on to the server or workstation with Administrator privileges.

2 Download and extract the required driver files from www.tandberg.com.

3 The system may automatically detect the DLT-V4 tape drive and display the "Found New Hardware Wizard". If the Wizard appears, proceed directly to step 4, otherwise start the Wizard manually as follows:

   a Right-click **My Computer**, and select **Manage** from the drop-down menu. This will start the Computer Management applet.

   b In the left window under **System Tools**, double-click **Device Manager**.

   c In Device Manager, the DLT-V4 tape drive will be listed under either "Tape drives" or "Other devices". Locate the entry for the DLT-V4 tape drive. Then double-click that entry to display the Drive Properties.

   d Click the **Driver** tab. Then click **Update Driver ...**.

   e The "Upgrade Device Driver Wizard" will start. Proceed with step 4.

4 In the "Upgrade Device Driver Wizard", click **Next** to continue.

5 Select the radio button labeled "Display a list of the known drivers for this device so that I can choose a specific driver". Then click **Next**.

6 If the drive is unknown to the system, the next view is "Hardware Type". Otherwise, the "Select a Device Driver" view is displayed.

   a If the "Hardware Type" view appears, select either "Other devices" or "Tape drives". Then click **Next** to continue on to the "Select a Device Driver" view.

   b In the "Select a Device Driver" view, click **Have Disk ...**.

7 At the “Install From Disk” view, click **Browse ...**, and then locate the folder where you saved the driver files. Select the “QntmDLT.inf” file in that folder, and click **Open**.

8 At the “Install From Disk” view, verify that the drive letter and path shown are correct. Then click **OK**.

9 In the next view, highlight the Tandberg Data DLT-V4 tape drive, and then click **Next**. The “Start Device Driver Installation” view is displayed.

10 Click **Next** to install the driver.

> **Note:** If the Wizard should indicate that a driver already exists on the system and prompts you for a selection, select **New**. When the Windows 2000 Setup window is displayed, verify the correct path to the driver, and then click **Continue**.

11 The next view is “Completing the Upgrade Device Driver Wizard”. Click **Finish**. You may be prompted to reboot your system.

The DLT-V4 device driver is installed.

Chapter 3

Specifications

This chapter contains the DLT-V4 tape drive specifications.

Physical Description

Physical Dimensions and Weights

Table 5 Physical Dimensions

Specification	Internal Tape Drive	Tabletop Tape Drive
Height	1.656 in. (42.05 mm) with the bezel 1.618 in. (41.10 mm) without the bezel	2.608 in. (66.24 mm)
Width	5.748 in. (146.00 mm) behind the bezel 5.807 in. (147.50 mm) with the bezel	8.352 in. (212.13 mm)
Length	8.614 in. (218.80 mm) measured from the rear of the front bezel 8.874 in. (225.40 mm) including the bezel	10.728 in. (272.49 mm)

Table 6 Weight Specifications

Specification	Internal Tape Drive	Tabletop Tape Drive
Unit Weight	3.00 lb. (1.36 kg)	8.00 lb. (3.63 kg)
Shipping Weight	4.39 lb. (1.99 kg) depending on the configuration	11.81 lb. (5.36 kg) depending on the configuration

Temperature and Humidity Ranges

Table 7 lists the operating temperature and humidity ranges of the tape drive.

Table 7 Operating Temperature/Humidity Ranges

Specification	Value
Temperature Range	10 ºC to 40 ºC (50 ºF to 104 ºF)
Airflow	3.0 CFM (min.)
Wet Bulb Temperature	25 ºC (77 ºF)
Temperature Gradient	11 ºC (19.8 ºF) per hour (across range)
Temperature Shock	10 ºC (18 ºF) over two minutes
Relative Humidity	20% to 80% non-condensing
Humidity Gradient	10% per hour

Table 8 lists the storage and shipment temperature and humidity ranges of the tape drive.

Table 8 Storage and Shipment Temperature/Humidity Ranges (Packed or Unpacked)

Specification	Value
Dry Bulb Temperature	-40 ºC to 66 ºC (-40 ºF to 150.8 ºF)
Wet Bulb Temperature	46 ºC (114.8 ºF)
Temperature Gradient	20 ºC (36 ºF) per hour with 5º margin (across the range)
Temperature Shock	15 ºC (27 ºF) with 5º margin (over two minutes)
Relative Humidity	10% to 95% non-condensing
Humidity Gradient	10% per hour

Altitude

The tape drive operates normally in pressures from -500 feet to 30,000 feet.

Functional Specifications

Table 9 lists the DLT-V4 tape drive's functional specifications.

Table 9 Functional Specifications

Specification	Value
Formatted Capacity, Native Mode	160 gigabytes (GB)
Formatted Capacity, Compressed Mode[a]	320 GB
Interface	Wide Ultra SCSI 2, Low-Voltage Differential (LVD) and SATA
Tape Drive Type	DLT Derivative, streaming, 160 GB; 16-bit LVD
Recording Type	Partial Response Maximum Likelihood (PRML)
Read Compatibility[b]	DLT-V4, DLT VS160, DLT VS80 / DLT1
Write Compatibility	DLT-V4
Form Factor	5¼-in. half-height
Sustained Transfer Rate, Native Mode	Up to 10 megabyte (MB) per second
Sustained Transfer Rate, Compressed Mode[a]	Up to 20 MB / sec
Transfer Rate, Burst	160 MB / sec
Error Rate (Unrecoverable)	1 in 10^{17} bits (non-media error)

a. Compressed values use a nominal 2:1 compression ratio. Actual compression ratios achieved depend on the redundancy of data files being recorded.
b. Performance may vary when the tape drive reads data previously written to the DLT VS80 and DLT1 formatted data cartridges. Performance depends on the quality of the data cartridge you are reading, not the DLT-V4 tape drive.

Emissions

The tape drive meets the following standards:

- FCC CFR Part 15 Class B (ANSI C63.4: 1992, CISPR22: 1997)
- EMC Directive (89/336/EEC)
- EN 55022: 1998, +A1:2000, +A2:2003 Class B
- IEC/CISPR 22: 1997, +A1:2000, +A2: 2003 Class B
- VCCI-03:2004 Class B
- CNS 13438
- AS/NZS 3548
- ICES – 0003

Safety Requirement

The tape drive meets the following standards:

- Low Voltage Directive (73/23/EEC)
- UL 60950 – US Standard: Safety of Information Technology Equipment including Electrical Business Equipment
- CSA C22.2 #950 – Canadian Standard: Safety of Information Technology Equipment including Electrical Business Equipment
- EN 60950-1:2001, 1st Edition – European Standard: Safety of Information Technology Equipment including Electrical Business Equipment

Consumer Bulletin Scheme

The tape drive meets this scheme: CB Scheme – The Scheme of the IECEE for Mutual Recognition of Test Certificates for Electrical Equipment.

Timing Characteristics

Table 10 lists the timing characteristics of the DLT-V4 tape drive.

Table 10 Timing Characteristics

Specification	Value
Read / Write Tape Speed	118 inches per second
Rewind Tape Speed	160 inches per second
Linear Search Tape Speed	118 inches per second
Average Rewind Time	68 seconds
Maximum Rewind Time	135 sec
Average Access Time (BOT)	84 sec
Maximum Access Time (from BOT)	168 sec
Load to BOT — previously recorded tape	90 sec
Unload from BOT	22 sec (no brush), 61 sec (brush)

Data Cartridge and Media Characteristics

Table 11 lists the data cartridge and media characteristics.

Table 11 Data Cartridge and Media Characteristics

Characteristic	Specification
Media Width	0.5 in.
Media Length	1,847 ft
Media Type	Metal Particle
Data Cartridge Dimensions	4.1 in. x 4.1 in. x 1.0 in.
Shelf Life	30 years minimum @ 20 ºC and 40% relative humidity (non-condensing)
Usage	600 hrs (150 full read / write uses)

Reliability Factors

Table 12 lists the reliability factors for the DLT-V4 tape drive.

Table 12 Reliability Factors

Factor	Hours / Cycles	Comments
Head Life	30,000 tape motion hours	Continuous operation.
MTBF	250,000 hours	The manufacturer does not warrant that predicted MTBF is representative of any particular unit installed for customer use. Actual figures vary from unit to unit. MTBF is measured at 100% duty cycle, excluding head life.
Load / Unload	50,000 cycles	This excludes media errors.

Statements for Class A Equipment (Internal Tape Drive)

CE Notice (European Union)

Marking by the symbol CE indicates compliance of this tape drive to the EMC Directive (89/336/EEC), and Low Voltage Directive (73/23/EEC) of the European Union. Compliance with these directives implies conformity to the following European Norms (the equivalent international standards and regulations are in parentheses):

- EN 60950-1:2001, 1st Edition, Safety of Information Technology Equipment including Electrical Business Equipment
- EN 55024: 1998 (IEC 1000-4-2, 1000-4-3, 1000-4-4, 1000-4-5, 1000-4-6, 1000-4-8, 1000-4-11) - "Information technology equipment – Immunity characteristics – Limits and methods of measurement"
- Part 2 - Electrostatic Discharge (ESD) Requirements
- Part 3 - Radiated Electromagnetic Field Requirements
- Part 4 - Electrical Fast Transient/Burst (EFT) Requirements
- Part 5 - Surge Requirements
- Part 6 - Conducted disturbances, induced by radio-frequency fields Requirements
- Part 8 - Power frequency magnetic field Requirements
- Part 11 – Voltage dips, short interruptions and voltage variations Requirements
- EN 55022:1998/(CISPR 22:1997), Class B, "Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment."

The following standards only apply to the tabletop tape drive:

- EN 61000-3-2: 2000, Limits for harmonic current emissions (equipment input) current up to and including 16 A per phase
- EN 61000-3-3: 2001, Limitation of voltage fluctuations and flicker in low-voltage supply systems for equipment with rated current up to and including 16A.

FCC Notices (U.S. Only)

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

User Manual Statements for Class B Equipment (Tabletop Tape Drive)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more, of the following measures:

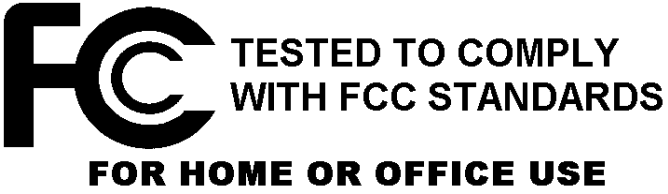
- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio /TV technician for help.

The user may find the following booklet prepared by the Federal Communications Commission helpful: *How to Identify and Resolve Radio-TV Interference Problems*. This booklet is available from the U.S. Government Printing Office, Washington D.C., 20402. Stock No. 004-00398-5

All external I/O cables connecting to this unit need to be shielded. See chapter 2, Installing the Tape Drive or the Quick Start Guide for more cabling options.

Caution: Any changes or modifications made to this equipment may void the user's authority to operate this equipment.

FCC Label



IC Notice (Canada)

This Class [B] digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe [B] est conforme à la norme NMB-003 du Canada.

VCCI Notice (Japan)

この装置は，情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＢ情報技術装置です。この装置は，家庭環境で使用することを目的としていますが，この装置がラジオやテレビジョン受信機に近接して使用されると，受信障害を引き起こすことがあります。
取扱説明書に従って正しい取り扱いをして下さい。

DEN-AN Notice (Japan)

すべての電源コードが同じ定格電流を使用するとは限りません。同封されている電源コードを他の製品と一緒に使用しないでください。また、家庭用の延長コードをQuantum製品と一緒に使用しないでください。複数の電源コードを必要とする製品の電源を完全に切るには、システムに接続しているすべての電源コードを外してください。

Class B ITE Translation

This is a Class B product based on the standard of the Voluntary Control Council for Interference from Information Technology Equipment (VCCI). If this product is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.

VCCI Class B ITE Regulatory Mark

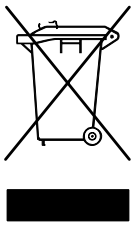
Environmental Compliance

The manufacturer is committed to providing quality products in an environmentally sound manner and to comply with all applicable environmental laws, rules and regulations.

This product was designed, manufactured and made available with consideration to worldwide laws, rules and regulations applicable to the product and the electronics industry including the European Union Directives 2002/95/EC & 2002/96/EC (RoHS and WEEE).

For further information on Environmental Compliance and Global Citizenship, please consult the manufacturer's Web site at http://www.tandberg.com .

Disposal of Electrical and Electronic Equipment



This symbol on the product or on its packaging indicates that this product should not be disposed of with your other waste. Instead, it should be handed over to a designated collection point for the recycling of electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please visit the manufacturer's Web site at http://www.tandberg.com or contact your local government authority, your household waste disposal service or the business from which you purchased the product.

Chapter 4

Using Your Tape Drive

This chapter contains information regarding the functional operation of the DLT-V4 tape drive.

LED Indicators

The tape drive has four light emitting diodes (LEDs). This section describes the functions of the LEDs.

> **Note:** The front panel controls and indicators are in the same locations on both the internal and tabletop tape drives. The tabletop tape drive has a **Power** LED.

Power-On Self-Test (POST) Indicator Activity

Each time you apply power to the tape drive, or reset the tape drive, it performs a power-on self-test (POST). During POST, the LEDs illuminate one at a time, from left to right. First, the **Ready** LED (Green) comes on, followed by the **Fault** LED (Orange) approximately one second later, then the **Clean** LED (Orange) approximately one second later, then four seconds later the **Media** LED (Orange) illuminates. Each LED signifies a different portion of the power-on process. All LEDs turn off momentarily. If no data cartridge is loaded in the tape drive, the **Ready** LED then illuminates steadily and POST is complete. This process takes approximately eight seconds. If a data cartridge is in the tape drive

during POST, the **Ready** LED flashes until the tape drive executes a mid-tape load, which can take several minutes. As POST completes, the tape drive makes a faint buzzing noise for several seconds. The noise associated with this activity is normal for this technology and does not indicate a problem with the tape drive.

Normal Operation — Ready LED Indicator Activity

During normal operation, the **Ready** LED displays one of the three following states. The **Ready** LED acts independently of the other LEDs.

Table 13 Ready LED Indicator Activity

State	Description
Off	Indicates that there is no power to the tape drive.
On	Indicates that power is on, no data cartridge is loaded, or a loaded data cartridge is idle with no tape motion.
Blinking	A data cartridge is in the process of loading, or there is tape motion on a loaded data cartridge. Tape motion includes reading, writing, locating, rewinding, calibrating, and so on.

Normal Operation — Fault / Clean / Media LEDs Indicator Activity

The **Fault**, **Clean**, and **Media** LEDs work together to display the status of the tape drive.

Table 14 Fault / Clean / Media LEDs Indicator Activity

Fault	Clean	Media	Description
○	–	◗	Unsupported format, unsupported data cartridge type, or damaged data cartridge
○	○	●	A DLT1 (DLT VS 80) formatted DLTtape IV data cartridge is loaded. Represents a read-only or VS160 formatted cartridge.
○	◗	–	Calibration error or permanent write / read error, cleaning suggested

Fault	Clean	Media	Description
○	●	○	Cleaning required—250 tape motion hours exceeded since last cleaning
○	»	–	Cleaning in process
›	○	○	User invoked write/read diagnostic failed
›››	○	○	Servo or mechanical error
●	–	–	Internal firmware error

Key	
–	Off
●	On
›	Blinking–slow (approximately once per second)
»	Blinking–medium (approximately twice per second)
›››	Blinking–fast (approximately three times per second)
○	Indicates that the status of this LED does not depend on the specific tape drive condition. This means that certain tape drive conditions may result in a combination of two or more of the LED states in the chart. For example, if you need to clean the tape drive while a DLT1 tape is loaded, both the **Clean** LED and **Media** LED are on steadily. If an internal write/read diagnostic fails due to a permanent write error, both the **Fault** LED and **Clean** LED blink slowly.

Unload Button Functions

You can use the unload button to unload and eject data cartridges, and for the additional features shown in the following table. Press and hold the eject button for the time specified in the following table to activate one of these features. Release the button when the LEDs display the desired sequence.

Caution: The two features noted in the following table will over-write any data on the data cartridge. Do not use this feature if the data cartridge in the tape drive contains critical data.

Table 15 Unload Button Functions

Description	Ready (green)	Fault (orange or clear)	Clean (orange or clear)	Media (orange or clear)	Hold Time (seconds)
Normal unload function	●	○	○	○	**0 to 6**
Reserved	◗	–	–	–	**6 to 9**
Enter code load tape mode	◗	◗	–	–	**9 to 12**
Reserved	◗	◗	◗	–	**12 to 15**
Reserved	◗	◗	◗	◗	**15 to 18**
Revert back to normal mode	●	–	–	–	**18 to 21**
Read / write diagnostic start **Caution:** This feature overwrites any data currently on the data cartridge.	●	●	–	–	**21 to 24**
Reserved	●	●	●	–	**24 to 27**

Description	Ready (green)	Fault (orange or clear)	Clean (orange or clear)	Media (orange or clear)	Hold Time (seconds)
Emergency reset	●	●	●	●	**27 to 30**
Revert back to normal mode	–	–	–	–	**30+**

Key			
–	Off	●	On (orange or green)
◗	Blinking	○	Unchanged from previous condition

Unload Button Actions

This section describes the unload button activity.

Table 16 Unload Button Actions

Field/Mode	Actions
Normal unload function	Release the unload button to unload the data cartridge.
Enter code load tape mode	Release the unload button to accept a data cartridge that contains the firmware image (code load). The LEDs then indicate code load mode. Insert the data cartridge to begin the code update. The tape drive returns to normal operation if you do not load a data cartridge within 15 seconds.

Field/Mode	Actions
Read / write diagnostic start	**Caution:** This feature overwrites any data currently on the data cartridge. Before performing this action, confirm that the data cartridge in the tape drive does not contain critical data. Release the unload button to start an internal read / write diagnostic. You must then load a data cartridge to run the diagnostic. The tape drive writes and reads 3.6 GB of data, then unloads the data cartridge. This process takes approximately 13 minutes. When completed, the green LED remains steadily on. At this point, push the **Eject** button to eject the cartridge. The tape drive returns to normal operation if it detects no errors. The appropriate LEDs illuminate if an error occurs.
Emergency reset	Release the unload button to force an internal reset. The tape drive initializes as if you turned power off and then on (POST).
Revert back to normal mode	Release the unload button to return the tape drive to normal operation.

Diagnostic Mode Event Codes

Press, hold, and release the unload button after six to nine seconds to start the diagnostic mode. This displays the most recent event code. The unload button then becomes a scroll button for additional event codes. Press and release the unload button for the next most recent event code. You can display up to five total events using this method. See table 17 for details about the meaning of the various patterns.

After you display the final available event code, the next button press causes all LEDs to flash indicating that the next eight hex characters displayed are the detailed error code of the most recent event. The first

character is either a hex E (error) or a B (bug check). You can look up the remaining seven characters in the error / bug check definition tables. When you display the last (eighth) detailed error code digit, the next button press returns the tape drive to normal operation. All indications are a four bit hex value.

During any time in this procedure, the tape drive returns to normal operation if you perform no scroll action within 15 seconds.

Table 17 Diagnostic Mode Event Codes

LED Fault Code	Failure
0001	SCSI Event
0010	General Error
0011	Software Bug Check
0100	Permanent Write Error
0101	Permanent Read Error
0110	Servo Fault
0111	Code Update was Completed
1000	Illegal Format
1001	Invalid Cartridge
1010	Calibration Failure
1011	Cleaning was Completed
1100	Directory Read or Write Failed
1101	Diagnostic Failed
1110	POST Failure
1111	Reserved

Chapter 5
Using Data and Cleaning Cartridges

This chapter contains information about data and cleaning cartridges.

Data Cartridge Use and Care

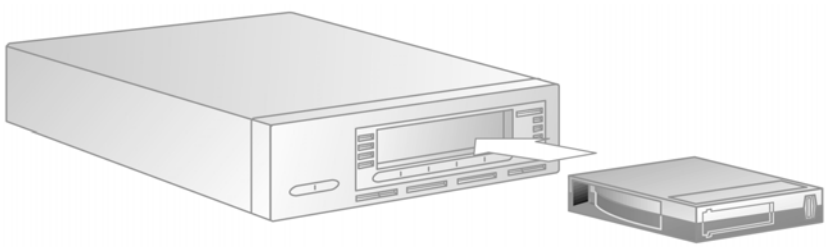
Your DLT-V4 tape drive reads and writes DLTtape VS1 data cartridges unless they have been previously written with VS 160 format. Your DLT-V4 tape drive can read (but not write to) DLTtape IV data cartridges previously written with the DLT1 / VS80 format and VS1 data cartridges previously written with the VS 160 format.

> **Note:** The tape drive automatically ejects any data cartridges whose format it cannot read. Make sure all data cartridges that you use for data backup are DLTtape VS1 data cartridges.

Loading a Data Cartridge

Loading a data cartridge into your DLT-V4 tape drive is easy. After the tape drive completes POST, insert the DLTtape VS1 data cartridge into the cartridge slot, oriented as shown in figure 18 and push the data cartridge gently into the tape drive until it stops.

Figure 18 Loading a DLTtape VS1 Data Cartridge



The **Ready** LED blinks while the tape drive loads the data cartridge. When the data cartridge is ready to use, the tape drive illuminates the **Ready** LED. If the data cartridge is a DLTtape IV written using the DLT1 (VS80) format, the tape drive also illuminates the **Media** LED.

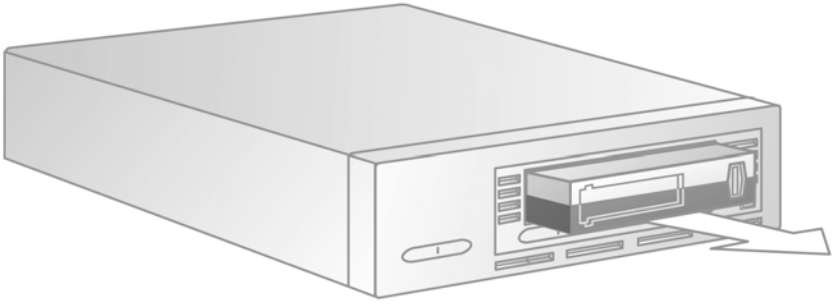
Unloading a Data Cartridge

To unload a data cartridge from your tape drive, follow these steps:

Caution: Remove the data cartridge from your tape drive before powering off the tape drive—or the server or workstation for an internal tape drive. Leaving a data cartridge in the tape drive when power is off can result in data cartridge and tape drive damage and may cause data loss because the header / catalog data may not be properly written before the tape drive loses power.

1. Press the Unload / Eject button or use your tape backup software to unload the data cartridge. The **Ready** LED blinks while the tape drive rewinds the tape.
2. When the tape drive has rewound the tape, it ejects the data cartridge, as shown in figure 19.

Figure 19 Unloading a DLTtape VS1 Data Cartridge from the Tape Drive



3 Remove the data cartridge from the tape drive.

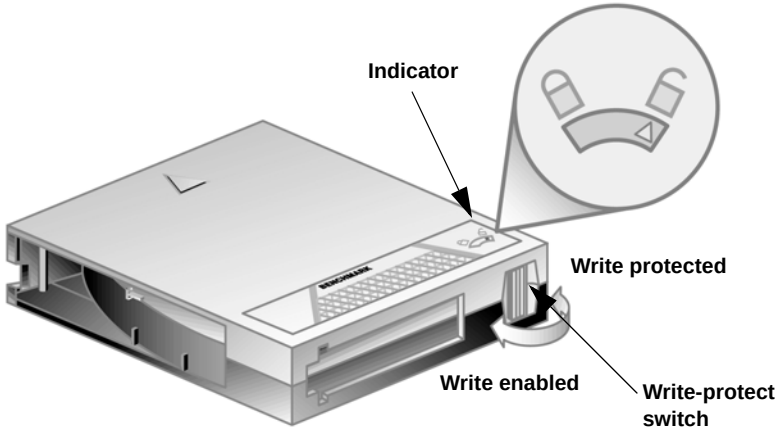
4 Return the data cartridge to its plastic storage case to prolong data cartridge life.

Write-Protecting the Data Cartridge

All data cartridges have a write-protect switch to prevent accidental erasure of data. Before loading a data cartridge into your tape drive, make sure to position the write-protect switch on the front of the data cartridge as desired, as shown in figure 20.

- Write Protected — Slide the switch to the right to write-protect the data cartridge. A “locked” icon appears on the switch indicating that the data cartridge is write-protected.
- Write Enabled — Slide the switch to the left to allow your tape drive to write data to the data cartridge. The “unlocked” icon appears on the switch. The indicator on the top of the data cartridge also points to the appropriate icon, indicating the write-protected status. In addition, DLTtape IV cartridges are automatically write protected. DLTtape VS1 cartridges that have been pre-written in a DLT VS160 are automatically write protected.

Figure 20 DLTtape VS1 Data Cartridge Write-Protect Switch



Caring for Your Data Cartridges

To ensure the longest possible life for all of your DLTtape VS1 data cartridges, follow these guidelines:

- Maintain clean and smoke-free operating and storage environments.
- Do not drop or strike a data cartridge. Excessive shock can displace the tape leader, making the data cartridge unusable and possibly damaging your tape drive.
- Store your data cartridges in their plastic storage cases.
- Do not expose your data cartridges to direct sunlight or sources of heat, including portable heaters and heating ducts.
- The operating temperature range for your data cartridges is 10 ºC to 40 ºC (50 ºF to 104 ºF). The storage temperature range is 16 ºC to 32 ºC (60 ºF to 90 ºF).
- If a data cartridge is exposed to temperatures outside the ranges specified above, stabilize the data cartridge at room temperature for the same amount of time it was exposed to extreme temperatures, up to 24 hours.
- Store your data cartridges in a dust-free environment in which relative humidity is always between 20% and 80% (non-condensing). The ideal storage relative humidity is 40%.

- Do not place data cartridges near sources of electromagnetic energy or strong magnetic fields, such as computer monitors, electric motors, speakers, or X-ray equipment. Exposure to electromagnetic energy or magnetic fields can destroy data on data cartridges.
- Place identification labels only in the slide-in slot on the front of the data cartridge.
- Never use any type of adhesive labels or “sticky” notes on data cartridges—they can become dislodged inside the tape drive and entangled in the mechanism.
- Do not use graphite pencil, water-soluble felt pens, or other debris-producing writing instruments on your labels. Never erase a label—replace it.

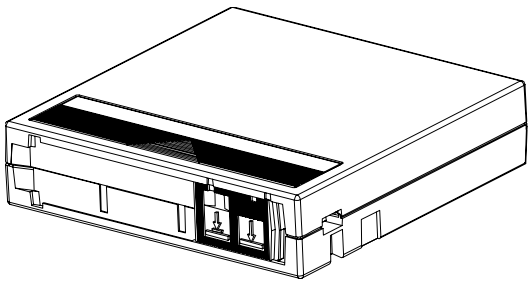
Using the Cleaning Cartridge

When the **Clean** LED is illuminated, your tape drive’s read / write head needs to be cleaned.

Caution: Follow the instructions as detailed in Loading a Data Cartridge on page 54 to load the cleaning cartridge. The DLT-V4 tape drive will accept only a DLT VS1 cleaning cartridge. Cleaning typically takes several minutes, during which the **Clean** LED blinks. If you attempt to load an inappropriate type of cleaning cartridge, your DLT-V4 tape drive prevents damage by ejecting the cartridge after approximately 25 seconds without allowing the cleaning tape to come into contact with the read / write head.

Use only approved cleaning cartridges in your DLT-V4 tape drive. Use of any other type of cleaning cartridge can damage the read / write head in your tape drive.

Figure 21 DLT VS1 Cleaning Cartridge



Each cleaning cartridge has a useful life of 20 cleanings. The cleaning cartridge includes a label with 20 small boxes printed on it. Place a check mark in one of the boxes each time you use the cleaning cartridge to clean the tape drive. Replace the cleaning cartridge when you have checked all boxes.

When the cleaning cartridge has cleaned the read / write head, the **Clean** LED turns off and the tape drive ejects the cleaning cartridge.

Glossary

A

Access (v.) To read, write, or update information on a storage medium, such as magnetic media. (n.) The operation of reading, writing, or updating stored information.

Access Time The interval between the time a request for data is made by the system and the time the data is available from the tape drive.

Advanced PRML Advanced Partial Response Maximum Likelihood. The advanced PRML channel technology provides high-encoding efficiency recording densities for greater capacity and performance.

Allocation The process of assigning particular areas of the media to particular data or instructions.

Archiving The removal or copying of data from the computer system onto secondary storage media that is safely stored away.

ASIC Application Specific Integrated Circuit.

ASTM American Society for Testing and Materials.

B

Backup A copy of a file, directory, or volume on a separate storage device from the original, for the purpose of retrieval in case the original is accidentally erased, damaged, or destroyed.

Bad Data Block A block that cannot reliably hold data because of a media flaw or damaged format markings.

Base Plate An aluminum die casting that acts as the support platform for the other modules and for the tape drive enclosure. The base plate includes the precision mounting holes used to install tape drives into a server or tape library.

Bezel (Also known as the faceplate.) A plastic panel that extends the face of a tape drive so that it covers a computer's tape drive bay opening.

BIOS Basic Input/Output System. A set of routines that work closely with the hardware to support the transfer of information between various elements of the system, such as memory, disks, and peripheral devices.

Block A sector or group of sectors. DLT-V4 supports block sizes up 16 MB.

BOM or BOT Beginning of Media or Beginning of Tape. The physical beginning of the media.

BRC Backward-read Compatibility is the ability of a current tape drive product to read cartridges written on earlier model tape drives.

BSMI Bureau of Standards, Metrology, and Inspection (Taiwan).

Buckling Mechanism The buckling mechanism engages the media leaders on cartridge load and disengages them on cartridge unload.

Buffer An area of RAM reserved for temporary storage of data that is waiting to be sent to a device. The data is usually on its way to or from the tape drive or some other peripheral device.

Bus The part of a chip, printed circuit board, or interface designed to send and receive data.

C

C The degree Celsius (°C) is a unit of temperature.

Cache Specialized RAM used as a buffer between a fast CPU or I/O channel and storage which has a relatively slow access time (for example, cartridge or diskette), to avoid slowing down the former.

Cartridge Receiver At media insertion, the cartridge receiver assembly is responsible for guiding the media into its operating position, opening the door, unlocking the cartridge brakes, and securing the media for operation. At media ejection, the cartridge receiver assembly reverses the process and automatically ejects the cartridge a fixed distance from the front of the tape drive.

CE Council of Europe.

Compressed Capacity Capacity after data has been processed, using either software or hardware, to reduce storage space while maintaining data integrity. (See also Data Compression.)

CFR Code of Federal Regulations (United States).

CSA Canadian Standards Association, also known as CSA International.

CUP Code Update (a firmware update).

D

Data Compression A process that reduces the amount of storage space required to hold a particular block of data. Data transfer speed and total media capacity are affected by the data compression achieved. In accordance with industry practice, a typical compression ratio is 2:1 of data storage. Actual compression ratios achieved depend on the redundancy of data files being written.

dB A Decibel is a logarithmic unit of sound intensity; 10 times the logarithm of the ratio of the sound intensity to some reference intensity.

DC Direct Current is the continuous flow of electricity through a conductor such as a wire from high to low potential.

DCM The Data Control Module provides the path and guides for all media motion inside the tape drive and to write data to and read data from the media.

Device According to the SCSI specification, multiple SCSI devices can be connected to a single SCSI bus. Each SCSI device contains a SCSI ID number that can be set in the range 0 to 15.

Device Driver A low-level (usually kernel-mode) operating system component that enables a PC to communicate with peripheral devices such as printers, CD-ROMs, and tape drives. Each kind of device requires a different driver.

Differential A term referring to the electrical characteristics of the signal used on the SCSI bus interface. Differential signals minimize the effect of common mode signal noise and allow the SCSI bus to operate reliably over greater distances at a higher speed.

DLT Digital Linear Tape.

DLT*Ice* The manufacturer's firmware compliance management function of DLTSage, which provides secure archival functionality to the tape drive and tape cartridge.

DLTSage The manufacturer's suite of preventative maintenance diagnostic software tools that enables users to more simply mange tape storage environments.

DLZ Digital Lempel-Ziv 1 Algorithm is named after Abraham Lempel and Jacob Ziv. It is a data compression technique used in all tape drives.

E

EEC European Economic Community.

EEPROM Electronically Erasable Programmable Read-Only Memory. An integrated circuit memory chip that can store programs and data in a non-volatile state. These devices store firmware in tape drives, and can be erased and reprogrammed with new data.

EIM The Electronic Interface Module provides the main control function for the system and the interface from the system to the host computer, library, or autoloader.

EMC Electromagnetic Compatibility.

EMI Electromagnetic Interference.

EN EN standards are voluntary technical standards of the European Union and European Economic Area.

Encoding (n.) Characters (or bytes) of information converted to magnetic patterns on the media. (v.) The process of converting to the desired pattern.

EOD End of Data. Location on media where the last session stopped.

EOM or EOT End of Media or End of Tape. Logical EOM allows space to complete a write operation; physical EOM signifies that the media is completely used.

Erase The removal of data from media.

Error A message that occurs when there is a loss of ability to interpret recorded data; usually because of magnetic issues or defects in or on the media.

ESD An Electrostatic Discharge is a sudden flow of electric current through a material that is normally an insulator.

EU European Union.

F

F Fahrenheit is a temperature scale where a degree Fahrenheit (°F) is 5/9ths of a kelvin (or of a degree Celsius).

FCC Federal Communications Commission (United States).

Fibre Channel A high-speed serial architecture that allows either optical or electrical connections at data rates from 265 MB to 2 Gb per second. Fibre Channel is sometimes abbreviated FC.

Firmware Permanent or semi-permanent instructions and data programmed directly into the circuitry of a programmable read-only memory or electronically erasable programmable read-only memory chips. Used for controlling the operation of the computer or tape drive. Distinct from software, which is stored in random access memory and can be altered with ease.

FPM The Front Panel Module (also known as the bezel) is a plastic panel that extends the face of a tape drive so that it covers a computer's tape drive bay opening.

FUP Firmware Update.

G

GB Gigabyte
SI — 1,000,000,000 bytes or 10^9. This is the International System of Units (SI) definition commonly used by telecommunications and storage manufacturers.
GiB — 1,073,741,824 bytes, equal to 1024^3, or 2^{30}. This is the definition often used in computer science, computer programming, and in the majority of computer operating systems documentation. This measurement can be abbreviated as GiB (gibibyte) to avoid ambiguity, as defined in IEC 60027-2.
Note: For the purpose of this document we are using SI.

GS German Safety.

H

Head The tiny electromagnetic coil and metal pole used to create and read back the magnetic patterns on the media. Also known as the read / write head.

HiFN An ASIC (Application Specific Integrated Circuit) for the system that handles data compression.

HIM The Host Interface Module implements the interface between the host system and the tape drive.

HRE Hard Read Error.

HWE Hard Write Error.

I

ICM The Integrated Controller Module contains the main controller and servo microprocessor, the custom-designed ASICs, and the cache memory.

IEC The International Electrotechnical Commission is a standards organization that prepares and publishes international standards for all electrical, electronic, and related technologies.

IEEE Institute of Electrical and Electronics Engineers

Interface A hardware or software protocol—contained in the electronics of the media controller and tape drive—that manages the exchange of data between the tape drive and computer. The most common interfaces for small computer systems are AT (IDE) and SCSI.

ISO The International Organization for Standardization is an international non-governmental standard-setting body made up of representatives from national standards bodies.

ISV Independent Software Vendor.

J

Jumper A tiny connector box that slips over two pins that protrude from a circuit board. While in place, the jumper connects the pins electrically. The jumper can be moved to change electrical connections.

K

KB A kilobyte is a unit of measure equal to 1 thousand (1024) bytes.

L

LED Light Emitting Diode.

LGMR Laser Guided Magnetic Recording.

LVD Low Voltage Differential signalling is an electrical signalling system that can run at high speeds over cheap, twisted-pair copper cables.

M

µM A Micrometer is an SI unit of length. It is defined as one millionth of a metre (1×10^{-6} m), equivalent to one thousandth of a millimeter.

MB Megabyte
SI — 1 000 000 bytes or 10^6 bytes. This is the International System of Units (SI) definition used by telecommunications engineers and storage manufacturers.
1 048 576 bytes - 1024^2, or 2^{20}. This definition is often used in computer science and computer programming, when talking about the size of files or computer memory. The reason is that computers use the binary numeral system internally.
Note: For the purpose of this document we are using SI.

MRC Heads Magneto Resistive Cluster Heads. A cluster of small, cost-effective Magneto Resistive (MR) media heads packed densely together.

ms A Millisecond is equal to one thousandth of a second.

MSE Multi-mode Single-Ended is a signaling alternative for multi-mode SCSI devices that allows multi-mode SCSI devices to operate while SE SCSI devices are present on the bus.

MTBF Mean Time Between Failures.

N

Native Capacity The capacity of a given media product in its basic recording format (without the use of data compression).

Native Mode Refers to the uncompressed storage capacity of a media subsystem. (See Native Capacity.)

Node In referring to a Fibre Channel network, a node is any device attached to the network.

P

Parity A method of generating redundant information that can be used to detect errors in stored or transmitted data.

Peripheral A device added to a system as a complement to the basic central processing unit (CPU), such as a disk drive, tape drive, or printer.

Port In referring to a Fibre Channel network, a port connects a node to the network.

Positive Engagement Buckling Mechanism A highly robust, solidly engineered media leader-buckling mechanism for heavy-duty-cycle automated environments.

POST Power-on Self-Test. When power is applied to the tape drive, it performs a POST.

PRML Partial Response Maximum Likelihood is a method for converting the weak analog signal from the head of a magnetic disk drive into a digital signal. Also see Advanced PRML.

PWA Printed Wiring Assembly.

R

Restore To replace data on the hard drive with data obtained from another media device.

RoHS Restrictions on Hazardous Substances is an EU directive that restricts, and in some cases bans, the use of certain compounds in the manufacture of electronic equipment. RoHS mandates that new electrical and electronic equipment put on the market does not contain lead, mercury, cadmium, hexavalent chromium, poly-brominated biphenyls (PBB), or poly-brominated diphenyl ethers (PBDE).

S

SAN Storage Area Network.

SATA Serial Advanced Technology Attachment. A Serial ATA International Organization (SATA-IO) standard for the interface between a computer and peripheral controllers.

SCSI Small Computer System Interface. An American National Standards Institute (ANSI) standard for the interface between a computer and peripheral controllers.

SDLT Super Digital Linear Tape.

SE Single-ended SCSI Mode. A term referring to the electrical characteristics of the signal used on the SCSI bus interface. For each signal that needs to be sent across the bus, there exists a wire to carry it. SE SCSI uses one line for each signal, with all lines using a common ground reference.

Seek The movement of a read / write head to a specific data track.

Server A powerful computer system with a large tape drive capacity that serves the information access and communication needs of multiple users.

Shelf Life The length of time that media can be stored without losing its magnetic strength. For VS1 media, this period is 30 years or more.

SI The International System of Units.

SRAM Static RAM. A memory chip that requires power to hold its content.

T

Take-up Reel The reel inside every tape drive onto which DLTtape or Super DLTtape media is wound. The in-the-tape drive take-up reel enables DLTtape and Super DLTtape systems to operate using a single-reel cartridge and thereby pack more media and data into every cartridge.

TapeAlert™ A firmware feature that monitors and returns the results of the tape drive's on-going self-diagnosis activity.

Tape Path The path through which media moves from the cartridge, past the read / write head, and onto the take-up reel.

TCM The Tape Control Module implements the functions required to buckle and unbuckle the media and control the media motion.

Termination A physical requirement of the SCSI bus. A terminator is a device that attaches to both ends of an electrical bus and prevents reflection or echoes of signals that reach the end of the bus.

Track A linear or angled pattern of data written on a media surface. SDLT tape drives write information on multiple tracks simultaneously.

Transfer Rate The speed at which the data moves between a host (that is, tape drive) and a recorded device. Usually expressed as bytes / sec or bits / sec.

TTL Transistor-to-Transistor Logic is a class of digital circuits built from bipolar junction transistors (BJT), diodes, and resistors. It is the base for the semiconductor integrated circuit (IC) technology.

TUR Test Unit Ready (see also Take-up Reel).

U

UL Underwriters Laboratories is a testing laboratory, which develops standards for consumer products, chiefly dealing with product safety.

Unformatted Capacity The total number of usable byes on the media, including the space that will be required later to record location, boundary definitions, and timing information. (See also Native Capacity.)

Ultra320 A tape drive SCSI interface that provides a low-voltage differential (LVD) mode running up to 160 MB / sec and a single-ended (SE) mode running up to 40 MB / sec.

USB Universal Serial Bus is a serial bus standard for connecting devices to a computer.

V

V A Volt is the potential difference across a conductor when a current of one ampere dissipates one watt of power.

VCCI Voluntary Control Council for Interference by Information Technology Equipment (Japan).

W

W The Watt is the SI derived unit of power.

WEEE Waste Electronic and Electrical Equipment is an EU directive that mandates that producers of electronic goods assume the responsibility of recycling WEEE and create sustainable development programs to design more easily reusable and recyclable products.

WORM Write Once Read Many is a functionality, which provides secure archived records needed for government compliance.

TANDBERG DATA
Securing your Information

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